

Welcome to MATEC NetWorks Webinar

NetWorks Electronics 2010: A Systems Approach to Teaching Electronics

MATEC NetWorks is an NSF funded ATE Center helping faculty in Semiconductor, Automated Manufacturing, and Electronics education

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NetWorks is a part of MATEC, a member of
the Division of Academic and Student Affairs
at the
Maricopa Community Colleges.



National
Science
Foundation

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Webinar Procedures

- If you are listening by phone, please mute your phone by pressing #5.
- If you have questions during the presentation, please submit them in the **Chat Window**.
- At the end of the session we will answer as many questions as we can. Please type your questions in the **Chat Window**.



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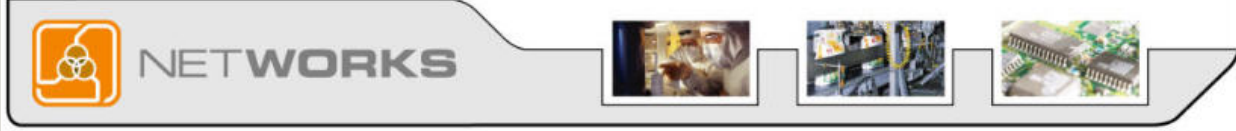
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NetWorks Webinar Presenter



Tom McGlew is the Project Manager for the ESyst grant, as well as the manager for NetWorks National Externship Program. He has worked in the electronics field for over thirty years.

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Electronics 2010: A New Systems Approach to Teaching Electronics Update Webinar

Presented by Tom McGlew

Maricopa Advanced Technology Education Center

Project Manager for NSF ATE Grant #0702753



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Agenda

- What has changed and what is a System?
- Project overview
 - Purpose
 - Goals
- Project status
 - Share latest developments from the ESyst Developers



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So what has changed and what is
a System?



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What has Changed?

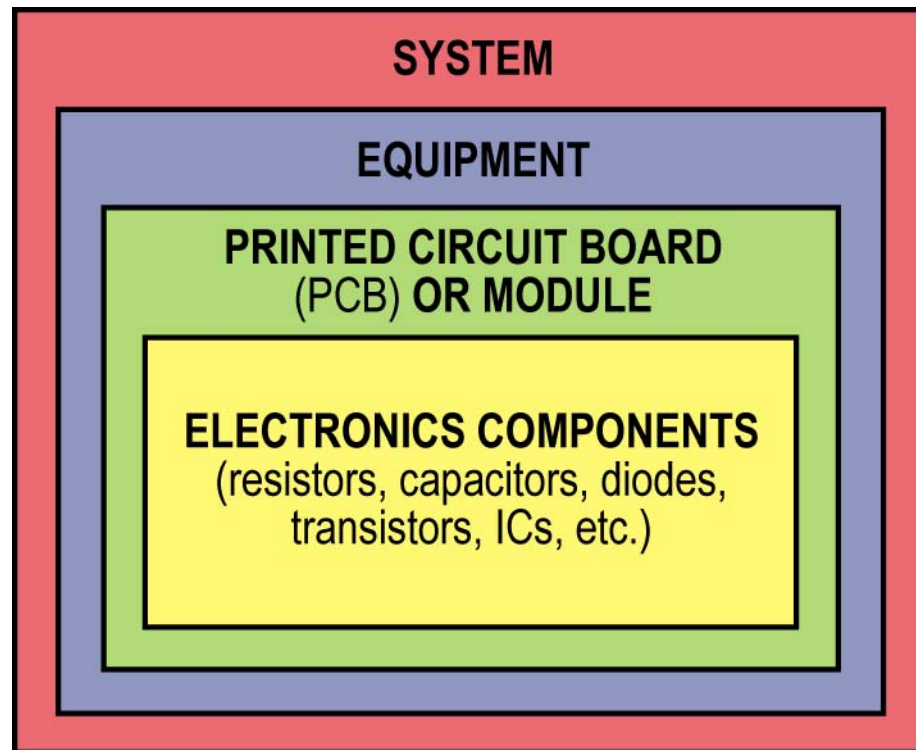
Today, the greater part of a tech's work now deals at higher level. Specifically, he or she works more with larger PCBs containing many ICs, plug-in modules, subassemblies, complete pieces of equipment, and entire systems which also include their power and cabling. The technician's work is performed at a higher level. The focus is on signal flow through the system and testing the system to see that it meets specific standards. Rarely does the tech replace individual components as was once the case.



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The Structure of Electronic Equipment



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What is a System?

A system is usually made up of **two or more pieces of electronic equipment** interconnected to do some particular function. For instance, a home entertainment system is made up of a **TV set, VCR, DVD, and DVR** units plus the audio components like a surround sound amplifier, CD player, tuner, speakers, and other equipment.



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Technician's Role in a System?

The technician's role today is more in dealing with the whole system than the details of the individual components. Because it costs more to repair a PCB or module at the component level than it does to buy a new module, defective modules are simply discarded and replaced with a new ones. Not only is it less expensive to do this but it is also faster and less disruptive to the user.



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What is an Electronic System?

For electronics, we can say that a system is an assembly of electronic and sometimes mechanical components as well as the software that operate together as a unit to perform some function.



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Questions?



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Project Overview

- Purpose:
 - Change the way electronics technology programs prepare students for electronics systems technician roles in today's industry settings.
 - Switch from component/circuit analysis focus to a systems approach focus.



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Project Goals

1. Revise curriculum and courses, create new materials for faculty and student learning and enrichment, and to provide guidance for faculty in the usage of the emerging systems view of electronics resources.
2. Develop a complete web-based delivery system for the resources associated with the Systems View of Electronics Technology.



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Project Goals continued

3. Increase enrollments and retention in electronics technology programs.
4. Ensure the curriculum addresses the needs of industry by incorporating the most recent electronic methods, circuits, systems, and practices involving simulations and online laboratories.



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Which Courses Need Updating?

- DC and AC Circuits Analysis (combined)
- Solid State Devices and Circuits
- Digital Logic and Circuits
- Microprocessor Applications
- Test, Measurement, and Data Acquisition
- Communications



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Curriculum impact!

First Semester (Fall)

ELE 105 Algebra/Trig for Technology

ELE 111 Circuit Analysis 1

ELE 132 Digital Logic and Circuits

ELE 181 Computer Programming

Second Semester (Spring)

ELE 112 Circuit Analysis 2

ELE 121 Solid State Dev. And Circuits

ELE 241 Microprocessor Concepts

GTC 106 Industrial Safety

GTC 185 Electro-Mechanical Devices

Third Semester (Fall)

ELE 222 Solid State Dev. And Circuits 2

ELE 243 Microprocessor Applications

ELE 261 Communication System 1

COM 100 Intro to Human
Communication

GTC 104 Manufacturing Processes

Fourth Semester (Spring)

ENG 102 First Year Composition

ELE 251 Electronic Measurements

ELE 263 Communication Systems 2

Program used for this slide is from Mesa
Community College



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Student Learning Outcomes

1. The program graduate will be able to specify, install, program, operate, trouble shoot, and modify electronics systems.
2. The program graduate will have effective written and oral communication skills.
3. The program graduate will have the attitudes, abilities, and skills for adapting to rapidly changing technologies.



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Project Development Process

- *Review course descriptions from various institutions*
- *Textbook Reviews*
- *Generic current course outlines completed*
- Determine what stays, what goes, or what is modified to create the systems approach
- Convene an industry review panel
- Modify courses per industry recommendations
- Start development of new courses and resources
- Begin pilot testing



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Current Status of the Project



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Project Status

- Project evaluation metrics have been established.
- Project has begun developing the processes that will be used to evaluate the six core courses to determine what needs to be modified.
- Discussions have determined what should be included in the online system equipment.
- Weekly developer meetings began on Friday, September 21



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ESyst Product Development

- Product: What will a faculty receive to implement one of the six new Systems View courses?
 - Course Outline? Assessments?
 - Lab Activities? Communication Skill?
 - Presentation? Practical Example/Apps.
 - Implementation Guide ?



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Course Deliverables

- Course description
- List of course competencies
- Outline of course topics
- List of key concepts
- Recommendations for:
 - Topics to be removed
 - Topics with reduced coverage
 - Topics with increased coverage
 - New topics or sources to add



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Latest Developed Materials

- Show current materials for the DC/AC Systems Course.



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Systems Course Concepts

- What key systems concepts will be introduced and evaluated in each of the six new Systems courses?
 - Identify the current courses key concepts
 - Determine the needed Systems changes
 - Modified the key concepts



Systems Based Course Outlines

- Based on the key concepts for each course and their corresponding student learning outcomes, modify or develop from the generic course outlines, the new systems based outlines.
- These new course outlines will be used to develop the structure for implementing each new set of course resources to accomplish the transfer of the key system concepts.



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Student Learning Outcomes

- Based on the new key systems concepts, develop the Student Learning Outcomes to satisfied the transfer of the key concepts.
 - Concept examples
 - Lab activities
 - Student engagement via research projects...
- How are these to be demonstrated?



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Questions?



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Evaluations

- Concept Inventories
 - Pre-evaluation to gauge basic understanding of systems concepts.
 - Post-evaluation to gauge the transfer of the key concepts via the Student Learning Outcomes
- Other Evaluations
 - Research projects
 - Quizzes and Tests
 - Performance Eval.



Concepts

- Defined: Broad idea or general principle. The most basic understanding of something.
 - Add to course package.
- Question: How broad & how general?
- Are concepts the same as learning outcomes?
- How are they tied in to course topics?



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System Definition

- Collection of circuits on a chip (SoC).
- Collection of ICs on a PCB
- Collection of PCBs, modules, sub-assemblies
- Assembly of multiple pieces of equipment
- See WRE Systems module.
- ESyst motto: “Teach more systems and less circuits.”



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Lab Ideas Summary

- Greatest need in ESyst courses: system relevant lab exercises.
- NI ELVIS: agreed upon platform.
- Need ELVIS board ideas for each course.
- MIT iLabs
 - ELVIS-based
 - Existing MIT experiments
- Other: e.g. systems built from equipment.



Industry Advisory Group

- Must work currently in industry.
- Current or past technician experience required.
- Duties
 - Review course materials and labs (if possible), comment and critique
 - Recommend changes, additions, etc.
- Meetings (phone, MATEC/Phoenix)
- Other (What...surveys, how to capture their current knowledge & needs?)



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The Textbook Problem & Possible Solutions

- Recommend existing textbooks but:
 - Suggest chapters/sections to omit/de-emphasize
 - Recommend supplementation with WRE modules
 - Create new corrective supplemental WRE-like modules as needed. (www.work-readyelectronics.org)
- Write our own textbook.
- Avoid use of a traditional textbook and suggest alternative sources like online material or non-academic books.
- What else?



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Project Development Team

Members

Mike Lesiecki – Principal Investigator

Lou Frenzel - Project Lead Subject Matter Expert

Jesus A. del Alamo – M.I.T. Project Lead

Roy Brixen – Project Developer

Wayne Phillips – Project Developer

Jesus Casas – Project Developer

Ui Luu – Project Developer

Bassam Matar – Project Developer

James Hardison – M.I.T. Project Developer

Tom McGlew – Project Development Manager

Angela Obolsky – Project Administrator



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Questions?



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Our Logo and Web Site



www.esyst.org



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Thank you to everyone for
joining this update on the
Electronics Systems Project
Development Activities



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